WHAT IS CLAIMED IS:

1. An active sensor system for detecting optical behavior of one or more samples, said system comprising:

at least one substrate;

multiple illumination elements disposed on a first one of said at least one substrate, said illumination elements forming a multipixel illumination source, whereby portions of said samples are substantially uniquely illuminated by associated ones of said illumination elements;

multiple detector elements disposed on a second one of said at least one substrate and forming a multipixel detector interspersed with said illumination elements, whereby light returning in response to said illumination from said portions of said samples are substantially uniquely detected by associated detector elements;

an illumination control subsystem coupled to said multiple illumination elements for controlling said illumination of said portions of said samples; and

a processing subsystem coupled to said multiple detector elements for producing an output indicating a detected optical signal corresponding to said light returning from said portions of said samples.

2. The active sensor system of Claim 1, wherein said first one of said at least one substrate and said second one of said at least one substrate are the same substrate, and wherein said illumination elements are interspersed with said detection elements.

3. The active sensor system of Claim 1, wherein said first one of said at least one substrate and said second one of said at least one substrate are separate substrates, and wherein said illumination elements are associated by position within the multipixel illumination source with detection elements having a corresponding position within the multipixel detector.

4. The active sensor system of Claim 1, further comprising an imaging system for coupling an image from said multipixel illumination source to said samples, whereby said multipixel illumination source may be remotely located from said samples, while preserving the association of said illumination elements to said portions of said samples.

5. The active sensor system of Claim 1, further comprising an imaging system for coupling an image from said multipixel detector to said samples, whereby said multipixel detector may be remotely located from said samples, while preserving the association of said detector elements to said portions of said samples.

6. The active sensor system of Claim 1, wherein each of said multiple illumination elements is associated with a unique one of said detector elements.

7. The active sensor system of Claim 1, wherein each of said multiple illumination elements is associated with a group of said detector elements having at least two members.

8. The active sensor system of Claim 6, wherein each group of detector elements further comprises multiple filters having a unique optical characteristic, wherein each of said filters is coupled in the receiving path of an associated detector, whereby each group of detector elements resolves multiple optical characteristics of said returning light from an associated portion of said samples.

9. The active sensor system of Claim 8, wherein said optical characteristic is a wavelength passband characteristic.

10. The active sensor system of Claim 8, wherein said optical characteristic is a polarization characteristic.

11. The active sensor system of Claim 1, wherein each of said multiple detector elements is associated with a group of said illumination elements having at least two members.

12. The active sensor system of Claim 11, wherein each illumination element within each group of said illumination elements has a unique emission characteristic, whereby each group of illumination elements illuminates said associated portion of said samples with one or said unique characteristics in response to said illumination control subsystem.

13. The active sensor of Claim 12, wherein each group of illumination elements further comprises multiple filters having a unique optical characteristic, each of said multiple filters within a given group coupled to the output of a unique illumination element within said given group, whereby each illumination element within each group of said illumination elements has a unique emission characteristic.

14. The active sensor system of Claim 12, wherein said unique emission characteristic is a wavelength characteristic.

15. The active sensor system of Claim 12, wherein said unique emission characteristic is a polarization characteristic.

16. The active sensor system of Claim 1, further comprising multiple microlenses, each coupled to an output of an associated one or more of said illumination elements, whereby illumination from said associated illumination elements is focused on said associated portions of said samples.

17. The active sensor system of Claim 1, further comprising multiple microlenses, each coupled to an output of an associated one or more of said detection elements, whereby fields of said associated detector elements are focused on said associated portions of said samples.

18. The active sensor system of Claim 1, wherein said illumination control system and said processing subsystem are integrated on said one or more substrates.

19. The active sensor system of Claim 1, wherein said multi-pixel illumination source and said multi-pixel detector each form a two-dimensional array of elements arranged in multiple rows and columns.

5

20. The active sensor system of Claim 1, wherein said multi-pixel illumination source and said multi-pixel detector each form a one-dimensional array of elements arranged in a single row.

21. An active sensor for detecting optical behavior of one or more samples, said active sensor comprising a unified structure comprising:

a substrate forming a bottom layer of said active sensor;

multiple illumination elements disposed on said substrate, said illumination elements forming a multipixel illumination source, whereby portions of said samples are uniquely illuminated by associated ones of said illumination elements; and

multiple detector elements disposed on said substrate and forming a multipixel detector interspersed with said illumination elements, whereby light returned from said portions of said samples in response to said illumination are detected by associated detector elements further associated with said illumination elements associated with said portion.

22. The active sensor of Claim 21, further comprising:

an illumination control subsystem integrated on said substrate and coupled to said multiple illumination elements for controlling said illumination of said portions of said samples; and

a processing subsystem integrated on said substrate and coupled to said multiple detector elements for producing an output indicating detected fluorescence from said portions of said samples.

23. An active sensor for detecting optical behavior of one or more samples, said active sensor comprising a sandwich structure comprising:

a first substrate forming a first outside layer of said active sensor;

multiple illumination elements disposed on an inner side of said first substrate, said illumination elements forming a multipixel illumination source, whereby portions of said samples are uniquely illuminated by associated ones of said illumination elements;

a second substrate forming a second outside layer of said active sensor on an opposite side of said sandwich structure from said first substrate; and

multiple detector elements disposed on said second substrate and forming a multipixel detector interspersed with said illumination elements, wherein said one or more samples are positioned between said multiple illumination elements and said multiple detector elements, whereby light leaving said portions of said samples in response to said illumination are detected by associated detector elements further associated with said illumination elements associated with said portion.

24. A method for measuring optical behavior of portions of one or more samples, said method comprising:

illuminating portions of said one or more samples with a multipixel illuminator having multiple illumination elements, wherein each of said illumination elements is associated with a unique one of said portions;

detecting light returning from said portions of said one or more samples in response to said illuminating, said detecting performed by a multipixel detector having multiple detection elements, wherein each of said detection elements is associated with a unique one of said portions; and

processing a result of said detecting to obtain a mapping of optical behavior of said one or more samples.

25. The method of Claim 24, wherein said detecting detects emissions from each of said portions using a group of detectors each having a bandwidth-limited detection characteristic with respect to other members of said group, whereby said detection resolves multiple wavelengths of said returning light.

26. The method of Claim 24, wherein said detecting detects emissions from each of said portions using a group of detectors each having a polarization-limited detection characteristic with respect to other members of said group, whereby said detection resolves multiple polarizations of said returning light.

27. The method of Claim 24, further comprising focusing a field of each of said illumination elements on said associated portion.

28. The method of Claim 24, further comprising focusing a field of each of said detection elements on said associated portion.

29. The method of Claim 24, further comprising imaging a field of each of said illumination elements on said associated portion.

30. The method of Claim 24, further comprising imaging a field of each of said detection elements on said associated portion.

31. The method of Claim 24, wherein said illuminating comprises sequentially selecting one or more of said illumination elements, whereby selected ones of said associated portions are illuminated at one time.

32. The method of Claim 24, wherein said illuminating comprises simultaneously illuminating all of said illumination elements.

33. The method of Claim 24, further comprising remotely imaging said illuminating through an imaging system, whereby said illumination elements are remotely located from said portions of said samples.

34. The method of Claim 24, further comprising remotely imaging said detecting through an imaging system, whereby said detection elements are remotely located from said portions of said samples.

35. The method of Claim 24, further comprising placing said multipixel detector and said multipixel illuminator in close proximity to said one or more samples, whereby said portions of said samples are associated with unique detection elements and unique illumination elements by proximity.